# S O I L  C O N S E R V A T I O N  D I G E S T

(Monthly newsletter of the California-Nevada Region)

Issued at Headquarters, Region #10, Santa Paula, California

Volume 3, No. 3 December 1936

U. S. D E P A R T M E N T  O F  A G R I C U L T U R E

SOIL CONSERVATION SERVICE

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| Charles W. Petit, District Manager | Santa Paula |
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| George Hardman, State Coordinator - Nevada | Reno |

CALIFORNIA-NEVADA

GOING - GOING - GONE!

Several years ago an advertising campaign for a hair tonic featured three drawings illustrating successive degrees of baldness. The captions were, "Going - time for (the tonic)," "Going - still time for (the tonic)," and "Gone - too late for (the tonic)."

Preliminary yield studies and general observations of field conditions suggest the possibility that land subject to erosion passes through several stages of continuously decreasing yields which would still pay for the installation of erosion control measures. Finally, however, erosion reduces the yields to the point at which they not only fail to pay for control measures, but also they fail to pay the costs of raising the crop, and farming is carried on on eroded fields at a net loss.

Plots tested this year suggest that yields decrease slowly as the first few inches of topsoil are removed, each inch lost causing a greater reduction in yield than the one before, and drop sharply as the last few inches are washed away. In other words, yields fall slowly when the topsoil starts to go, faster while it is going, and are reduced to practically nothing when it is gone and with it all chance of keeping the field in cultivation.

We know that some soils are non-productive when the topsoil has been stripped from them. We also know that others continue to produce crops despite severe erosion. Although we are fairly sure which soils fall into each group, we know little about the actual amount of reduction of yield in relation to varying degrees of erosion of each soil.

The Service is now working on these problems, but the accumulation of such information is necessarily slow. Farmers would therefore benefit themselves by making careful observations of the yields under various conditions of erosion in their own fields before cheerfully concluding that erosion is not causing enough loss of income to warrant doing anything about it. In other words - stop erosion while the soil is "GOING - GOING." Do not wait until it is "GONE."

SOME NEVADA RANGE GRASSES
By Arthur E. Miller, Regional Range Examiner

Galleta Grass
Hilaria jamesii

Galleta grass, a common grass in certain parts of Lincoln County, Nevada, stands grazing well, and due to its extensive root system is valuable in controlling erosion.

Big Galleta Grass
Hilaria rigida

Big Galleta grass, while less valuable for grazing, is even more effective than Galleta in controlling soil-washing and -blowing. This grass can be seen growing on very poor range in parts of southern Nevada where moisture supply is limited. In many places the soil is very sandy and subject to blowing. On such areas Big Galleta is the only grass to be found extensively and even where it is buried, or nearly blown out, resumes growth after the first rain.

Blue Grama Grass
Boutelova gracilis

Blue grama grass, sometimes called flag grass, is the most important palatable range grass in Lincoln County. In addition to its forage value it is useful in controlling soil erosion on sage brush and juniper lands. Its characteristic habit of going dormant when moisture conditions are poor and resuming growth when soil temperature and moisture are favorable makes this grass particularly valuable.

Even though the original stand of the grasses mentioned above has been reduced they remain the most important forage grasses in southern Nevada. As they grow from underground root stalks as well as from seed, much more can be accomplished from the standpoint of erosion control and increased forage by maintaining them rather than attempting to reseed the range artificially.

Indian Rice Grass
or Sand Grass
Oryzopsis hymenoides

Indian Rice grass is highly palatable forage but is also very susceptible to over-grazing. Under careful management this grass has increased at many places. With reasonable moisture conditions it is one of the grasses that is well adapted to southern Nevada. It grows on sandy soil. Its chief drawback is that it reproduces only from seed and can be easily reduced in stand by heavy grazing.

CCC ENROLLEES IN SOIL CONSERVATION SERVICE CAMPS
WIN PRAISE OF FOREST SERVICE IN FIRE SUPPRESSION WORK

San Francisco, California
December 15, 1936

Mr. Arthur E. Burns,
Regional Administrator, ECW,
Soil Conservation Service,
Santa Paula, California.

Dear Mr. Burns:

Reference is made to the cooperative fire suppression agreement between your office and the U. S. Forest Service, Region 5.

The close of the fire season is approaching and it seems fitting at this time to extend to you, to members of your staff, to your ECW facilitating personnel and to the CCC men who built the miles of fire line during the past season, the appreciation of the Forest Service for the very fine way assistance was given on fires. The length of the ride to fires, many times over rough roads, the loss of sleep, the hour of the day, be it in the middle of the night or just before the evening meal was being served; the hard, gruelling work to accomplish on the fire lines; the heat, smoke and the many other difficulties encountered in suppressing a fire, were accepted as part of the game by your men and were met with the fortitude that only real men can show.

The Forest Service does not know how to repay your organization for its efforts, other than to say that thru its cooperation losses of timber, scenic and watershed areas, wild life, recreational and other values were held much below what would have occurred without the assistance of your organization.

With the hopeof continued cooperation during the next fire season, I remain

Very truly yours,

(sgd) S. B. Show,
Regional Forester.

# SOIL CONSERVATION ENGINEERING

-by-
Donald C. Johnson, Regional Engineering Staff

Why do we need engineering in soil conservation work? To intelligently answer this question one must first ask, "what is meant by engineering?" Is it the application of methods to preserve and encourage the existence of wildlife? Is it the method of surveying used in the location of the various types of soil? Has it anything to do with the conservation of our soil by means of agronomic control? Or does engineering in conservation work consist only of the mysterious motions of some theoretical slide rule artist trying to figure out the most difficult way by which a simple rock dam can be built, with accompanying plans and formulae, which any intelligent farmer would figure out after a four-year correspondence course in higher mathematics?

Science and Good Judgment

In the strict sense of the word, engineering might be described as the application of exact science in the design and construction of various types of structures and construction. However, good judgment is generally considered the most important single qualification of an engineer. In simple words then, engineering may be considered the application of science and good judgment in the accomplishment of the particular type of work engaged in.

From this point of view one can imagine the general term "engineering" as embracing an infinite number of specialized branches. That such is the case is evidenced by such specialized branches as ceramic, photogrammetric, refrigeration, industrial engineering, etc.

Soil Conservation Engineering

In many ways soil conservation has presented an entirely new field in engineering. Deviation from long established practice in some phases of engineering is required in order to treat problems in a practical way from the farmers' point of view. Original and experimental work is essential in successfully establishing sound engineering practice in such a new field of endeavor. In soil conservation work this is particularly true and decidedly

more so in the various portions of the country that have yet to be levelled to the easy slopes where there is no question as to the relative merits of agronomic or mechanical control of erosion.

Control of Soil Erosion

Engineering in this Service is concerned principally with mechanical control methods for the prevention of soil erosion. Agronomic control is accepted as the most natural way of doing this job. It is used in combination with mechanical control in a large portion of the work. It is taking the place of mechanical control in some instances where it demonstrates ability to withstand the erodible effects of higher velocities in run-off. Conditions exist, however, in areas where relatively steep slopes exist and rainfall does not occur in sufficient quantity or at proper times for maintaining plant growth, where mechanical control of some nature is required.

Economical Construction

In the demonstration work some of the structures have appeared to be too elaborate, costly, and not in keeping with the farmer's ability to do the work unassisted by technical help. Whether or not this type of construction is warranted in each case is a problem peculiar to the individual case. Effort is being made constantly to minimize the amount of construction and design involved in these structures. It is, in general, one of the main objectives of the engineering department to develop more simple, economical method of construction.

The use of new types of materials or the use of new methods of working with the material we are familiar with, comprises one of the most important fields of endeavor in the engineering department.

Simple Methods

Another very important phase of the work is developing simple methods of controlling the flow of water in the countless number of conditions under which it occurs. Experimental work is necessary for progress in this line. Much has been learned about the behavior of water flowing under the conditions existing in soil conservation work.

Conservative practice as used in most irrigation work eliminates the necessity of finding out just how small and inexpensive a structure can be

and still do the work. Large factors of safety in construction and capacity, that are allowed, make the engineer's work more a matter of straight forward accepted safe practice. A more economical solution must be made in most cases in our work, involving a more careful study of hydraulics and the economic use of materials.

Helping Nature

To meet the demands of economy in our work ingenuity must be exercised constantly in taking advantage of what help nature has to offer. The field engineer's job is very important in this respect, as the proper selection of types of construction and the location best adapted to economic construction is most important, and involves a high degree of good engineering judgment.

Use of Engineering

Engineering, in its various forms of practice, is being used every day in practically all phases of soil conservation work. One branch of engineering, surveying, is necessary to both agronomic and mechanical control, particularly in the laying out of terracing and its appurtenant drainage systems and control structures. Drafting of all descriptions has become a very important function of the engineering department. Design has played a very important part of the control in the Pacific Coast region, due to the steeper slopes and the consequent need of careful design in both the hydraulic and structural field.

Engineering in The Field

Engineering in the field, including surveying, drafting, designing, location, control of construction, selection of materials and types of construction, observation of the performance of existing control methods etc., is a most important function, involving the exercise of good judgment based on experience in this specialized type of work.

Generally, then, the reason why we need engineering in soil conservation work is to translate the known scientific behavior of the materials we have to deal with through experiment and demonstration of these fundamentals in erosion control work, into practical, economical, simplified control of the elements of nature which the worker of the soil is most concerned with today.

## NAPIER (ELEPHANT) GRASS USED IN CONTROL OF SOIL EROSION

By C. B. Ahlson, Regional Agronomist

Napier or elephant grass grows so rapidly that we can almost see it increase in height as it springs from a root division to as much as fifteen feet in height during a single season. In appearance this grass looks much like sugar cane and in Africa, where it reaches its maximum development, its range extends from coast to coast across the tropical forest belt and from an altitude of nearly 3,000 feet to sea level. Its value lies in its production of a large quantity of top growth and litter as well as its strong and extensive fibrous root system which becomes quickly and permanently established in the soil.

Rapid Growth

This type of root growth makes it a particularly valuable plant to use for vegetative revetments, for bank protection in channels and gullies, and large terrace outlets. Willows are often used for this purpose, but because Napier grass grows so rapidly it is, where it will grow, more desirable for control measures such as these.

With favorable moisture and on fair to good soil, 30 to 100 stems will be produced during the first season from one small cutting, and on one ranch in Los Angeles County, young plants of Napier grass grew 14 inches in six days during July.

Use in Controlling Gullies

In controlling gullies Napier grass can be used in many ways. After the danger from large storms is past, double rows of cuttings may be planted along each side of the gully in the spring; or root-clump divisions in single rows may be set out in the fall if there is sufficient rainfall.

In protecting the sides of gullies just below dams, the use of this grass is very effective. The result accomplished by this method on the Rancho Ladero in southern California is a splendid example of its use. Here a gully, due to meandering, had become too deep and wide to cross with farm tools, thus preventing cultivation on over a quarter of an

acre of land. The attempt of the owners to control this gully by the use of vegetation was a noteworthy success. Cuttings of Napier grass were planted in early summer and by fall the gully was completely covered by a mass of vegetation 10 to 14 feet high. During the following rainy season this thick mass of vegetation filtered out enough silt carried in the storm water from the canyon above the ranch to fill the gully entirely.

Gully Controlled

As soon as the gully was filled the area was cultivated by a subsoiler and ordinary seedbed preparation quickly eliminated the remainder of the grass. At the present time walnuts intercropped with beans cover the site of the wide gully which was eating away the land before control measures were taken. A narrow-base terrace which is well protected by Napier grass now takes care of the storm water which ran through the gully.

Napier Grass on Demonstration Area

On demonstration projects in California the Soil Conservation Service has test plots that show what this plant will do under favorable conditions, and you are invited to visit one of these areas to see what is being accomplished by the use of Napier grass and other vegetative methods. If you would like to know if Napier grass will grow in your locality ask your county extension agent. He will give you particulars and tell you where you can get the plants.

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## CARRYING CAPACITY OF RANGE

No range should carry more than 80 to 85 percent of its average carrying capacity. The remaining 15 to 20 percent should be used as a reserve range to supplement forage requirements during seasons when food is scarce. Unless this is done the rancher is gambling that there will always be a good forage growth available for the next season, or he must gather his stock early and carry them through on purchased or grown feed.

## LET'S CONTROL DITCH BANKS

By Cornelius C. Ullman
Regional Agronomy Division

During the fall of the year it has been the general practice of farm operators to clean up weedy ditches and small drainage ways too difficult to cultivate, by burning-off. Roadside ditches, where mechanical scrapers cannot be safely operated, are treated likewise.

Rodents Harbored by Weed Infested Ditch Banks

The practice of burning such weed-infested areas is of particular importance to ranchers and farmers whose cultivated fields and orchards border these areas. Ditches and drainage channels overgrown with weeds are convenient nesting places for rodents which may cause serious damage to crops and orchards. This mass of annual vegetation, dying during the fall, may provide over-wintering localities for detrimental insects and plant diseases. In addition the dispersion of noxious weed seeds to the cultivated fields and orchards bordering these areas is of considerable economic importance.

Burning Increases Erosion Peril

The burning-off of vegetation from ditches and drainage ways during the fall has, however, the very serious disadvantage of increasing the peril of soil erosion. Sloping banks, barren of vegetation, are highly susceptible to the forces of erosion inherent in the severe rain storms of the winter season. This situation is particularly applicable to southern California. The rilling and sloughing-off of soil material from ditch banks resulting in the widening of such channels should be of real concern to the farmer. Good tillable land in many instances is encroached upon and washed away.

Desirability of Weed Elimination

Vegetation of any character will help keep the soil in place. The efficiency with which it does this work or its erosion-resisting quality varies greatly, however, with the type of ground cover produced and the rooting habit of the plant. Since weeds present a rather intolerable situation and in time, if left undisturbed, may cause a difficult channel maintenance problem, the elimination of this type of vegetation for erosion control on ditch banks would seem desirable.

Ice Plant For Cover

After burning-off ditch banks immediate steps should be taken to provide for the establishment of a desirable type of vegetative cover. Several perennial plants should prove worthwhile for this work. Varieties of ice plant have already proved their usefulness for this type of control work. Australian Saltbush and Lippia (Lippia canescens Kunth. L. repens of some authors) both low and close growing perennials, the former somewhat more drought-resistant, are to be recommended.

The usefulness of such types of plants lie not only in their erosion-resisting character, but also in their ability when properly established, of smothering weed growth.

Crested Wheat Grass

Another excellent grass which should be mentioned as being exceptionally useful for this type of control is crested wheat grass (Agropyron cristatum (L) Beauv.). This grass is highly drought-resistant. It forms a dense sod or bunch like cover, just the type of growth effective both for erosion and weed control. In addition the grass is good palatable feed.

The important factor in recommending drought-resistant kinds of plants is their ability to maintain themselves during the dry summer period in California.

Although the initial labor of establishing a cover on ditch banks with these kinds of plants may be considerable, the ultimate profit in soil saving and weed control should be clearly apparent.

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A large part of the work of the Soil Conservation Service nurseries is to collect seeds, not in handsful but by the tons, and to convert them into plants to be used for control of soil erosion.

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